(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 935 969 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.08.1999 Bulletin 1999/33

(51) Int. Cl.[6]: **A61M 5/00**

(21) Application number: **99102288.0**

(22) Date of filing: **05.02.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **10.02.1998 US 21425**

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(54) Flexible continuous strip package for medical syringes

(57) A syringe assembly includes a generally flexible supporting strip that maintains a plurality of syringes in a selected alignment. The supporting strip preferably includes first and second strips that are joined together to receive and maintain a barrel portion of each syringe between the first and second strips.

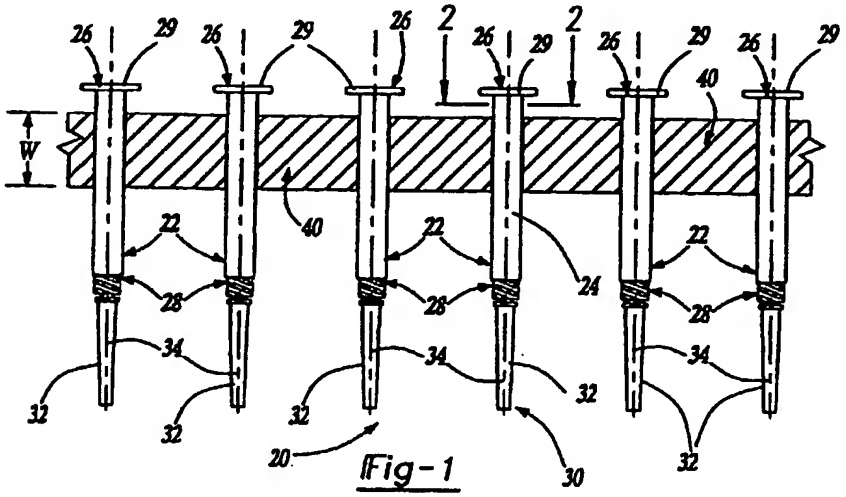

Fig-1

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Description

BACKGROUND OF THE INVENTION

[0001] This invention generally relates to an arrangement for packaging and handling medical syringes. More specifically, this invention relates to an arrangement including a continuous flexible strip that maintains a plurality of syringes in a preselected alignment for packaging and handling purposes.

[0002] Hypodermic needle syringes are well known and come in a variety of configurations. One challenge associated with all hypodermic syringes is properly and efficiently packaging and handling the syringes during manufacturing and pharmaceutical filling operations. Although a variety of packaging and handling techniques and machinery have been developed or proposed, most of these tend to be specialized for handling only one specific type of syringe. Moreover, most existing systems tend to introduce undesirable expense because the machinery is overly complex or there tends to be an excessive amount of wasted material that is discarded or needs to be recycled. Further, current packaging and handling methods are often labor-intensive, which introduces additional expense in the manufacturing or packaging process.

[0003] One solution that has been developed by the assignee of this invention includes connecting a number of syringes together with integral web portions extending between the syringes. This solution is shown in United States Patent No. 4,865,592, which issued on September 12, 1989. While that solution is useful for maintaining a generally parallel alignment of syringes for packaging and pharmaceutical pre-filling operations, it is not without shortcomings and drawbacks.

[0004] In the arrangement shown in U.S. Patent No. 4,865,592, the web portions that extend between syringes are integrally formed with the syringes themselves and made of the same material. This introduces unnecessary expense since the plastic material used to make such a syringe is also used for the connecting web portions. As the web portions are later removed and discarded this introduces unnecessary waste and does not minimize expense. Further, the rigid web portions limit the number of syringes that can be included in a single pace. Moreover, the arrangement of that patent is specialized in that it is only suitable for the specific type of syringe disclosed in that patent. Further, that arrangement requires the use of external tools or some device to separate the syringes when they are needed for use.

[0005] There is a need for a syringe assembly arrangement that facilitates packaging and handling syringes during manufacturing and pharmaceutical filling processes. Further, there is a need for such an arrangement that is adaptable to be used with a variety of syringes, that is inexpensive and that avoids the introduction of undesirable waste material. It would be additionally advantageous to have an arrangement that is reusable and simple to work with under a variety of packaging or handling situations.

[0006] This invention addresses those needs while avoiding the shortcomings and drawbacks of the prior art.

SUMMARY OF THE INVENTION

[0007] In general terms, this invention is a syringe assembly that includes a flexible strip that interconnects a plurality of syringes and maintains them in a selected alignment for efficient and easy handling during packaging and syringe-filling processes. A syringe assembly designed according to this invention includes a plurality of syringes, which each have a barrel portion on one end and a needle supporting portion at a second end. A central axis extends along a center of the barrel and needle supporting portions. The syringes preferably are made from a substantially rigid plastic material. A supporting strip, which preferably is made from a substantially flexible material, engages a segment of each barrel portion such that the syringes are maintained in a preselected relative alignment where the central axis of each syringe is substantially parallel with those of the other syringes. Further, a preselected spacing is maintained between the syringes along a single syringe assembly.

[0008] The supporting strip of this invention can take a variety of forms. One example embodiment includes a single strip of material having a plurality of barrel receiving portions where the syringe barrels are snap-fit into those portions and selectively maintained in the desired alignment by the supporting strip. In another embodiment, the supporting strip includes two strips that are snap-fit together and capture the syringe barrel portions between the two strips so that the syringes are maintained in the desired alignment. The most preferred embodiment includes two strips that are secured together while receiving the syringe barrel portions between the two strips. In this latter embodiment, the two strips can be maintained together by an adhesive or they can be made from a material that is heated and melted or fused together to form the supporting strip.

[0009] The various features and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the preferred embodiment. The drawings that accompany the detailed description can be briefly described as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1 is a diagrammatic illustration of a syringe assembly designed according to this invention.

Figure 2 diagrammatically illustrates selected details of the embodiment of Fig 1.

Figure 3 is a second embodiment of a supporting strip designed according to this invention.

Figure 4 is a diagrammatic illustration of an assembly process showing a third embodiment of a supporting strip designed according to this invention.

Figure 5 diagrammatically illustrates a arrangement of more than one syringe assembly designed according to this invention.

Figure 6 illustrates a method of packaging a plurality of syringe assemblies designed according to this invention.

Figure 7 illustrates another packaging arrangement that is useful with this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] Figure 1 illustrates a syringe assembly 20 where a plurality of syringes 22 are maintained in a selected alignment relative to each other. Each syringe 22 includes a barrel portion 24 extending along a substantial portion of the syringe 22 from a first end 26. A flange 29 at the end of the barrel portion 24 facilitates utilizing the syringe 22 during a normal hypodermic injection procedure. A needle supporting portion 28 is located near a second end 30 of the syringe 22. In the illustrated embodiment, a needle cover 32 is in place over the needle of the hypodermic syringe. A central axis 34 extends through the center of the barrel portion 24 and the needle supporting portion 28.

[0012] The syringes 22 are maintained in the preselected alignment, which preferably includes the central axes 34 of the syringes 22 being substantially parallel, by a supporting strip 40. The supporting strip 40 preferably is made from a substantially flexible material. The supporting strip 40 preferably is arranged lengthwise perpendicular to the axes 34 of the syringes 22. The supporting strip 40 engages the barrel portions 24 of the syringes 22 in a manner to be described in more detail below. The supporting strip 40 has a width W that is great enough to selectively maintain the syringes 22 in the preferred relative alignment.

[0013] The supporting strip 40 designed according to this invention can take a variety of forms. Figure 2 illustrates, in more detail, the embodiment of the supporting strip 40 from Figure 1. The supporting strip 40 includes a plurality of barrel receiving portions 42 and a plurality of connecting segments 44 extending between the barrel receiving portions 42. The barrel portion 24 of each syringe 22 preferably is snap-fit and received into a corresponding barrel receiving portion 42. An interior surface of the receiving portion 42 preferably includes ends 46 and 48 that engage the barrel portion 24 in a manner that maintains the syringe 22 in place on the supporting strip 40 until the syringe is selectively removed for use. The embodiment of Figure 2 preferably includes a barrel receiving portion 42 that circumscribes more than one half of the barrel portion 24 so that the ends 46 and 48 are positioned to be effective to maintain the syringe 22 on the supporting strip 40.

[0014] Figure 3 illustrates another embodiment of the supporting strip 40, which is designated as 40' in Figure 3. In this embodiment, the supporting strip 40' includes a first strip 50 and a second strip 52. Each of the strips 50 and 52 preferably are made from the same, substantially flexible material. The preferred material of this embodiment is plastic.

[0015] The first strip 50 includes a plurality of connecting segments 54 extending between barrel receiving portions 56. The connecting segments 54 preferably include a plurality of snap projections 58 extending from an interior surface of the first strip 50. The second strip 52 preferably includes a corresponding plurality of interconnecting segments 60 that extend between barrel receiving portions 62. The interior surface of the connecting segments 60 preferably include detents 64 that engage corresponding sections 58 from the first strip 50. In this manner, the first strip 50 is snap-fit to the second strip 52 and the barrel portions 24 of the syringes 22 are received in the barrel receiving portions 56 and 62 as desired.

[0016] The embodiment of Figure 3 has the advantage of being useable with a large variety of syringes 22 and can be made from a number of suitable materials. The embodiment of Figure 3 also provides a somewhat more secure connection between the supporting strip 40' and the syringes 22 compared to the embodiment of Figures 1 and 2.

[0017] The embodiments of Figures 1 through 3 have the advantage of being reusable and allow for selective removal or replacement of any particular syringe 22 from the assembly 20.

[0018] Figure 4 illustrates the most preferred embodiment of the supporting strip 40". Figure 4 diagrammatically illustrates an assembly arrangement for making a syringe assembly 20. A plurality of syringes 22 are supported on a moving support member 70 that preferably moves under control of a computer (not illustrated) in the direction of arrow 72. The syringes 22 move relative to a pair of reels 74 and 76. The first reel 74 supports a roll 78 of material that is a first strip of the supporting strip 40". Similarly, the reel 76 supports a roll 80, which is the second strip of the supporting strip 40". The preferred material for the first strip 78 and the second strip 80 is plastic, however, a variety of materials such as a foil or other substantially flexible materials could be used.

[0019] The first strip 78 and the second strip 80 preferably are joined together at the segments that extend between the syringe barrels. An inside surface of at least one of the first strips 78 or the second strip 80 can include an adhesive useful for bonding the two strips together in the intermediate segment portions. Alternatively, an adhesive can be placed on the inside surface (i.e., that surface that faces toward the syringe barrels and toward the other strip during the assembly proc-

ess). The adhesive can be heat-activated or a contact adhesive. Yet another alternative includes using a first strip 78 and a second strip 80 made from a plastic material that is easily melted together in a manner that the first strip 78 and the second strip 80 would be joined together without substantially deforming the plastic material.

[0020] A pair of moving members 82 each include an inner surface 84. The inner surfaces 84 actively engage the first strip 78 and the second strip 80 as the moving members 82 move inward and outward relative to the row of syringes 22 as illustrated by the arrows 86. The contour of the inner surfaces 84 preferably includes recesses 88 and 90 that nestingly receive the syringe barrels 22 as the moving members 82 move inward. Sufficient inward motion of the moving members 82 causes the first strip 78 to come into contact with the second strip 80 while simultaneously wrapping the first and second strips around the barrel portions of the syringes that are between the two moving members 82. In an embodiment where a contact adhesive is used to join the first strip 78 to the second strip 80, simply moving the moving members 82 toward each other so that the first and second strips come into contact is sufficient to secure the syringes 22 in the desired alignment supported by the supporting strip 40".

[0021] In an embodiment where a heat-activated adhesive is used, the interior surfaces 84 on the moving members 82 can include appropriately heated surfaces or heating elements that will activate the adhesive and cause proper bonding so that the syringes 22 are supported in the selected alignment. Similarly, in an embodiment where heated material is fused or melted together to form the supporting strip 40" the interior surfaces 84 include appropriate heated surfaces or heating elements to accomplish the desired joining of the first strip 78 and the second strip 80.

[0022] As can be appreciated from the illustration of Figure 4, four of the syringes 22 are secured between the first 78 and the second strip 80 each time that the moving members 82 move sufficiently inward to cause the first strip to be joined to the second strip. Further, as is shown in Figures 1 and 4, the supporting strip preferably is positioned near the first end 26 of the syringe 22. Placing the supporting strip about the barrel portion 24 is especially advantageous because it provides a more secure connection. The barrel portions 24 typically have a larger dimension than the needle supporting portions 22 and therefore provide more stable surfaces for connecting the syringes 22 to the supporting strip. Further, providing the connection about the barrel portion reduces the risk of damaging the needle supporting portion 28 of the syringes 22.

[0023] Under most circumstances, the syringes 22 preferably are removed from the supporting strip without the use of any external tools. In embodiments where the supporting strip includes two adhesively bonded strips (i.e., first strip 78 and second strip 80), when someone needs to remove a syringe 22 from the assembly 20, they simply separate the first and second strips. This operation would be similar to separating the first strip 50 and the second strip 52 of the embodiment of Figure 3. The difference between the two embodiments is that the adhesively bonded first and second strip, in most cases, cannot be manually rebonded together.

[0024] For the embodiments where the first strip 78 and the second strip 80 are effectively fused or melted together, a plurality of scores or perforations 96 preferably are provided in the intermediate sections extending between the barrels of the syringes. The scores or perforations 96 facilitate easily removing a selected number of syringes from the assembly without the use of external tools. The scores 96 preferably are formed during the assembly process by providing the inner surfaces 84 of the moving members 82 with appropriate projections that will form the scores or perforations 96 in the supporting strip 40" during the assembly process. Alternatively, the first strip 78 and the second strip 80 can be prescored or preperforated on the reels 74 and 76, respectively.

[0025] In the embodiments where the supporting strip 40" is secured about the barrel portions 24 in a manner where the barrel-receiving portions of the supporting strip remain on the syringes even after the syringes are removed from the assembly, the supporting strip material preferably is transparent so that any indicators marked on the syringe barrel portions are visible through the supporting strip.

[0026] Once a syringe assembly 20 is completed it provides the advantage of being readily usable in a prefilling operation. For example, high-speed pharmaceutical linear filling systems can readily receive an assembly 20 of a plurality of syringes 22. Further, the preselected relative alignment of the syringes 22 leaves them well-suited for oriented presentation into the prefilling system. Further, the syringes 22 can be sterilized in large quantities after they have been assembled into the syringe assemblies 20.

[0027] Another advantage to the assembly 20 is its ready usefulness for packaging a large number of syringes 22 for shipment or handling. Figure 5 illustrates how a first syringe assembly 100 can be nested together with a second syringe assembly 102). The syringes of the assembly 100 are interdigitated with the syringes of the assembly 102. In other words, the syringes of one assembly are placed in the intermediate spaces between the syringes of the other assembly.

[0028] Figure 6 illustrates a preferred orientation of the two assemblies 100 and 102 within a package 104. The continuous, flexible supporting strip allows a large number of syringes to be placed within the package 104 in a folded pattern. The folded pattern 106 of Figure 6 is preferred generally S-shaped. This allows for easy packaging that minimizes the amount of bulk packaging material that needs to be used in handling a large number of syringes 22. The stability of the alignment of

the syringes provided by the supporting strip 40 protects the syringes under most circumstances and reduces the mount of packaging material required. Further, the continuous supporting strip makes it easy for a selected amount of syringes 22 to be removed from a package without disturbing the entire arrangement of syringes on a repeated basis.

[0029] The most preferred alignment of a first assembly 100 and a second assembly 102 of syringes 22 is illustrated in Figure 7. In this orientation, the needle supporting portions 28 of one assembly are positioned facing in the same direction as the barrel portions 24 of the other syringe assembly. In other words, the first end 26 of each syringe 22 in the assembly 100 is adjacent the second end 30 of each syringe 22 in the second assembly 102. Such an arrangement maximizes packing density and allows a greater number of syringes to be placed within any given package.

[0030] The use of a variety of generally flexible materials for the supporting strip of this invention makes it useful and applicable for a large variety of syringe types. Further, the inventive arrangement allows for easy access to a selected number of syringes without requiring the use of external tools or devices to remove the syringes from the assembly. Further, relatively inexpensive materials can be used to form the supporting strip and the amount of wasted material is minimized when a syringe assembly is designed according to this invention.

[0031] The preceding description is exemplary rather than limiting in nature. The currently preferred embodiments of this invention have been disclosed. Variations and modifications of the disclosed embodiments may become apparent to those skilled in the art that do not necessarily depart from the purview and spirit of this invention. The scope of legal protection given to this invention can only be determined by studying the following claims.

Claims

1. A syringe assembly, comprising:

   a plurality of syringes each having

   a barrel portion including a first outside dimension at one end,
   a needle supporting portion including a second outside dimension that is smaller than said first outside dimension at a second end and
   a central axis extending along a center of said barrel and needle supporting portions, said syringes being made from a first, substantially rigid material; and

   a supporting strip made from a second, substantially flexible material and engaging at least a segment of each said barrel portion such that said syringes are maintained in a preselected relative alignment including a substantially parallel alignment of each said central axis with a remainder of said axes and a preselected spacing between each adjacent syringe.

2. The assembly of claim 1, wherein said supporting strip releasably maintains said syringes in said preselected alignment or said supporting strip engages each said barrel portion adjacent said first end of each of said syringes.

3. The assembly of claim 2, wherein said supporting strip comprises a single strip of said substantially flexible material and includes a plurality of syringe barrel receiving portions into which respective ones of said plurality of syringes are snap-fit, said syringe barrel receiving portions being spaced along a length of said strip at a distance corresponding to said preselected spacing between adjacent syringes.

4. The assembly of claim 3, wherein said syringe barrel receiving portions each include a generally semicircular cross section that snugly surrounds and maintains a received barrel portion in engagement with said strip until said barrel portion is manually removed from said receiving portion.

5. The assembly of claim 1, wherein said supporting strip comprises two strips of said substantially flexible material that are snap-fit together and said syringe barrel portions are maintained between said two strips when said strips are snapped together.

6. The assembly of claim 5, wherein a first one of said two strips includes a plurality of projections spaced along one side of said first strip and a second one of said two strips includes a corresponding plurality of detent members that received respective ones of said projections to maintain said first strip adjacent said second strip and to selectively maintain selected ones of said plurality of said syringes in said preselected relative alignment.

7. The assembly of claim 2, wherein said supporting strip is reusable such that a selected number of said syringes can be removed from respective barrel receiving portions and said barrel receiving portions subsequently selectively received and maintain said syringes in said relative alignment.

8. The assembly of claim 1, wherein said strip member comprises a first and second strip of plastic film each having an inner surface and an outer surface and wherein said syringe barrel portions are

received between said first and second strip inner surfaces.

9. The assembly of claim 8, wherein at least one of said first or second strip inner surface includes an adhesive and said inner surfaces are fixedly attached together at intervals between said syringe barrel portions; or said first and second films are heated together to remain fixedly attached to each other at intervals between said syringe barrel portions such that said syringes are maintained in said relative alignment; or said first and second strips are transparent.

10. The assembly of claim 9, wherein portions of said first and second strips that engage said barrel portions are fixedly adhered to said barrel portions and wherein interval portions of said first and second strips extending between said barrel engaging portions include perforations extending across said first and second strips.

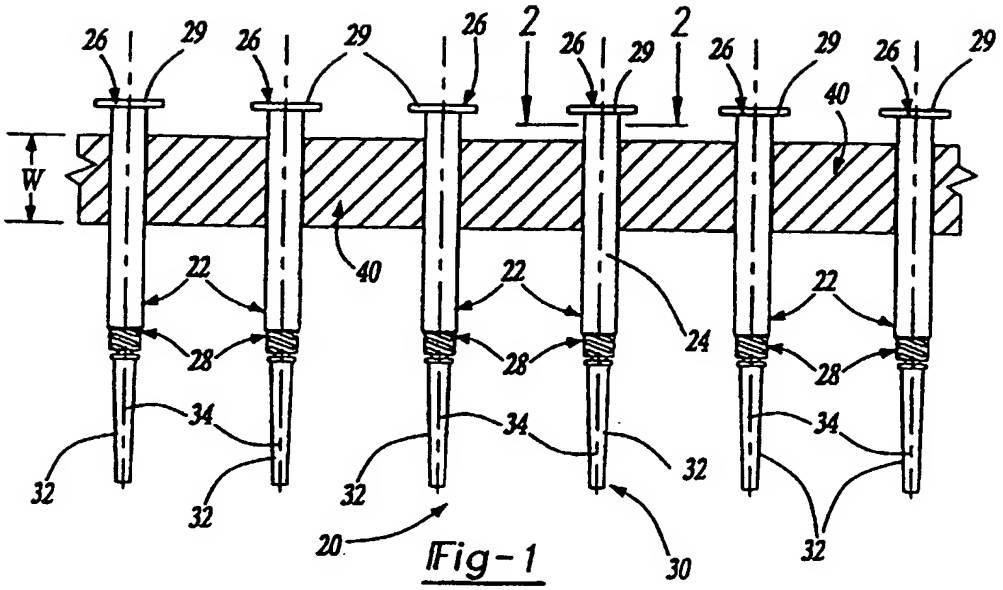


Fig-1

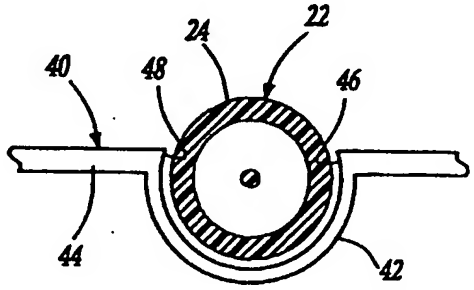


Fig-2

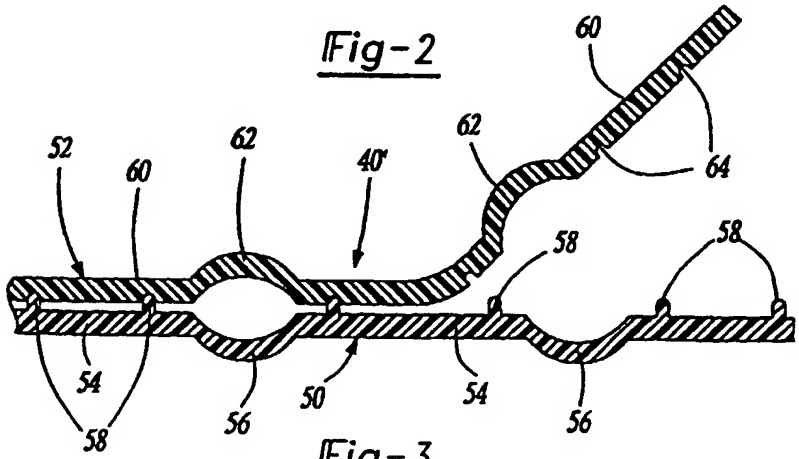
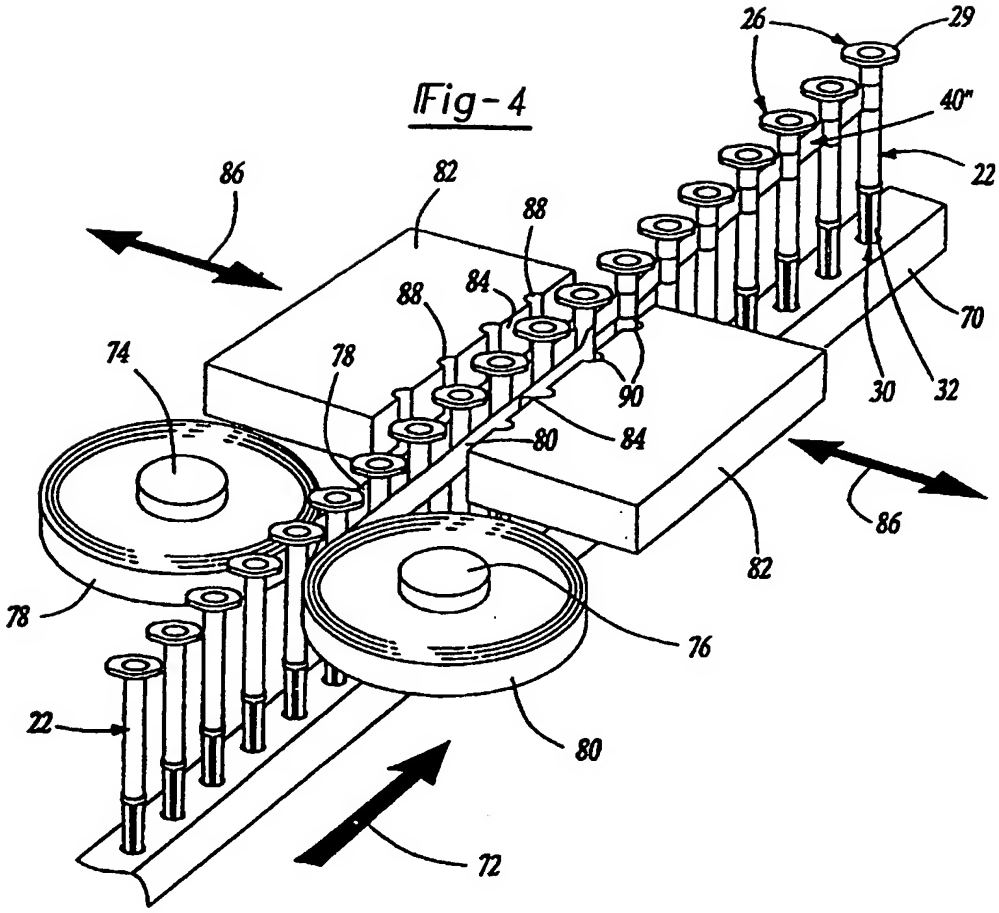


Fig-3

Fig-4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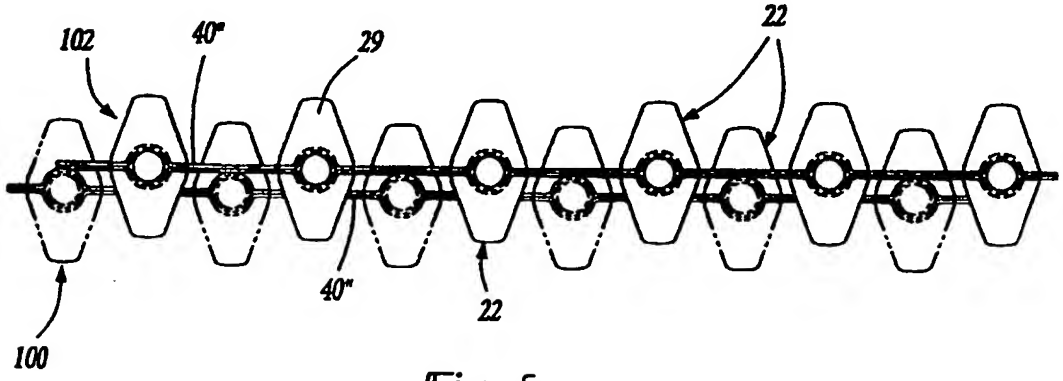
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Fig-5

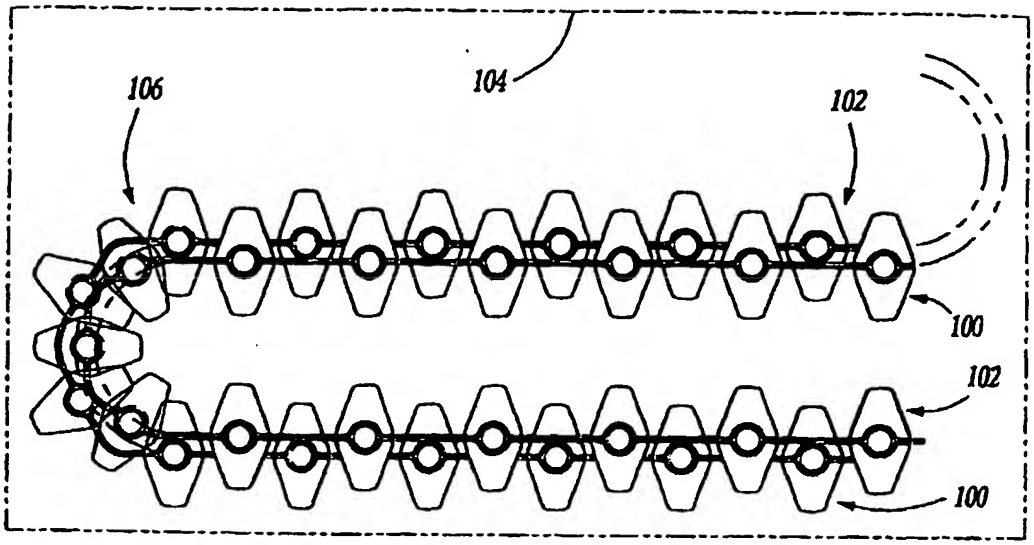
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Fig-6

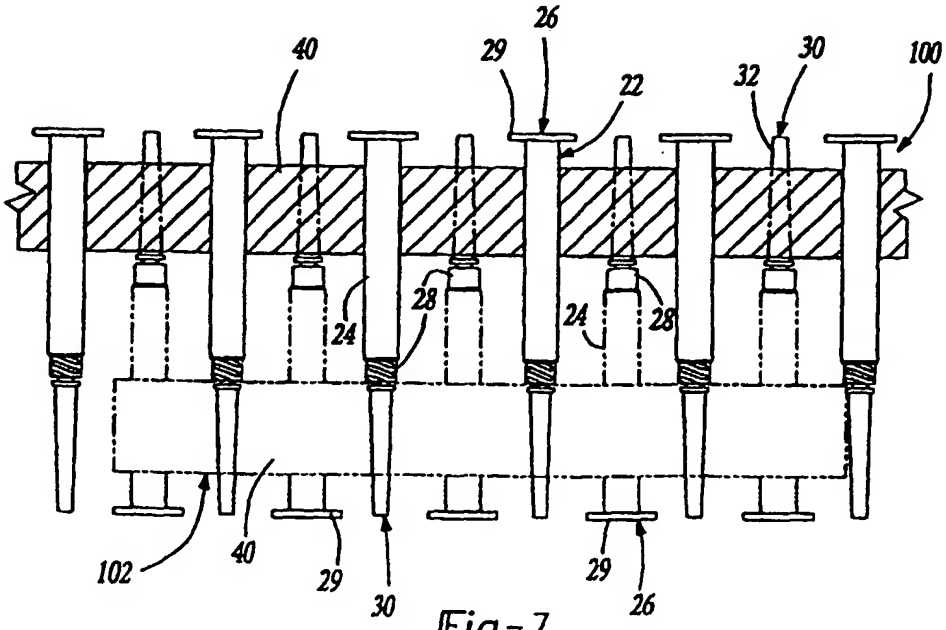
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Fig-7

(19) Europäisches Patentamt
European Patent Office
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(11) EP 0 935 969 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
29.12.1999 Bulletin 1999/52

(43) Date of publication A2:
18.08.1999 Bulletin 1999/33

(21) Application number: **99102288.0**

(22) Date of filing: **05.02.1999**

(51) Int. Cl.[6]: **A61M 5/00**, B65D 85/24, B65D 73/02

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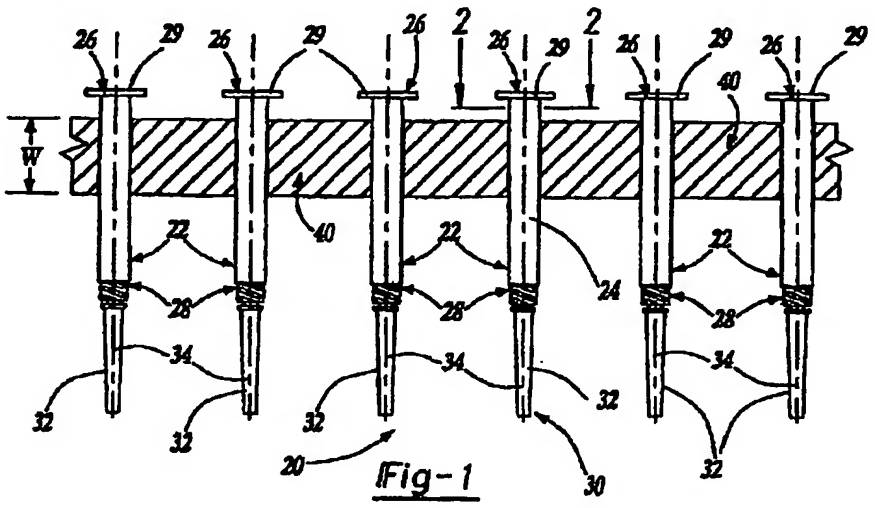

Fig-1

EP 0 935 969 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 10 2288

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	28 October 1999	Jameson, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 10 2288

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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28-10-1999

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